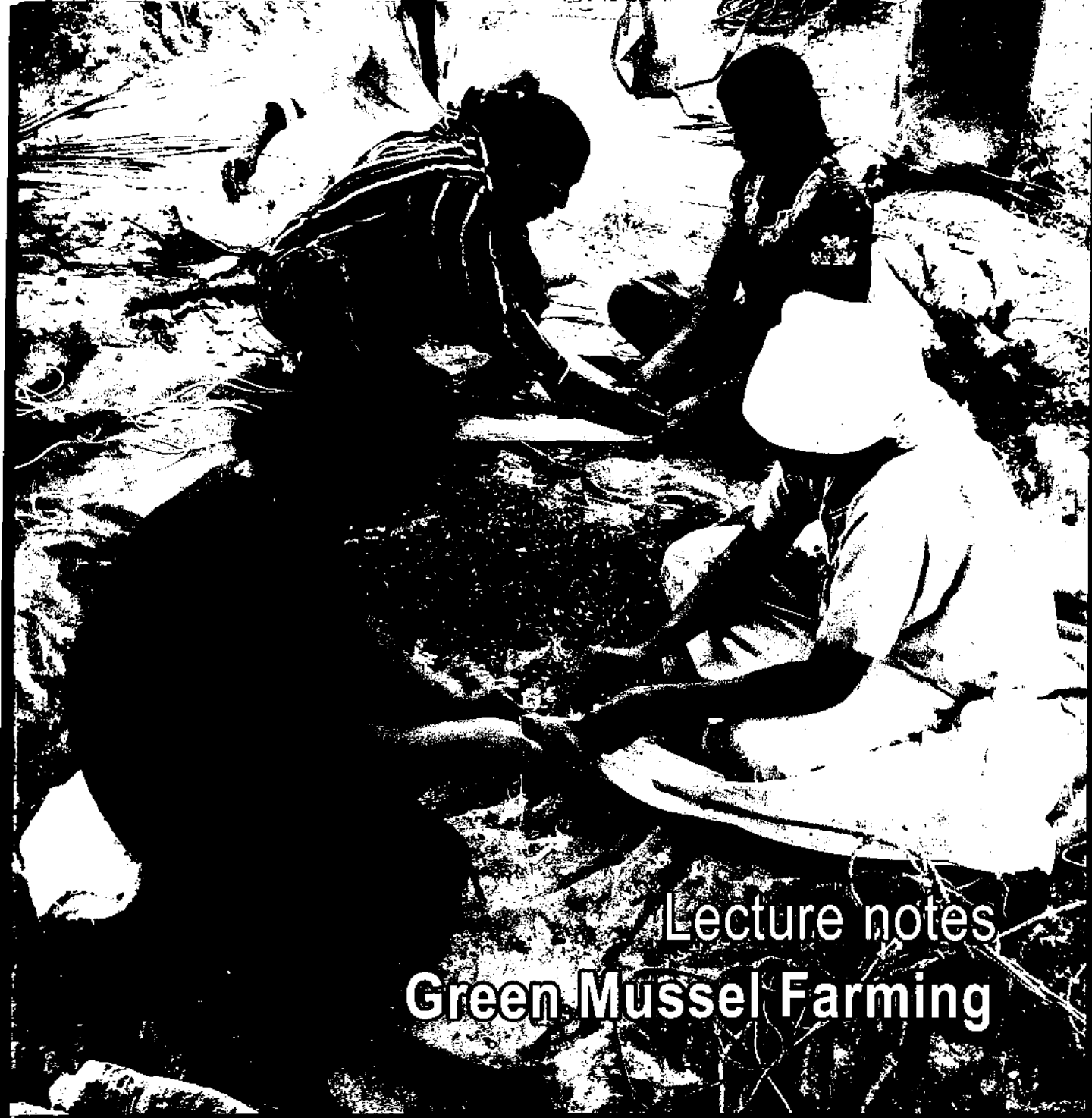

Lecture notes

Green Mussel Farming

CMFRI

NFDB

Training on

GREEN MUSSEL FARMING

LECTURE NOTES

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10-19 January 2011

CONTENTS

Biology of Green Mussel

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***Perna viridis* (Linnaeus, 1758)**

Phylum : Mollusca
Class : Bivalvia
Order : Mytiloida
Family : Mytiloidae

Common Name: Green mussel, Green lipped mussel, Green mussel, Asian green mussel, sea mussel, *kadukka / Kalumekai* in Malayalam.

Distinguishing Features: *P. viridis* is distinguished from the other two species of *Perna*, *P. indica* and *P. canaliculus*, by few physical features. *Perna viridis* begins its life as a juvenile with a green and blue-green shell that develops brown patches as an adult Internally, the exhalent siphon and the inner surfaces of the inhalant aperture are outlined with a stripe darker than the variably patterned dark brown mantle. Muscle scar are deeply impressed. Anterior adductor muscle is absent. The posterior adductor muscle is large, cylindrical, surface slightly elongate and located in the posterior half of the shell, a little above the antero-posterior axis of the body (Kuriakose and Nair, 1976) This Mytiloid is distinguished from all others of the genus by having 30 instead of 28 diploid chromosomes. The native range of the green mussel is along the Indian coast and throughout the Indo-Pacific. *Perna indica* is distinguished from *P. viridis* and *P. canaliculus* by mantle margins lined with enlarged sensory papillae. Young *P. canaliculus* has light colored zigzag markings on the outer shell and is found only in New Zealand.

Distribution: *Perna viridis* occurs naturally and is widely distributed along the intertidal coasts of India The green mussel is also local to Malaysia. *P. viridis* is broadly distributed in the Indo-Pacific where it ranges west from the Persian Gulf and east to New Guinea and Japan and New Guinea for north and south ranges, respectively. Nair and Murugan (1991) reported the presence of green mussel in 42 meter depth of the deep submarine tunnel system at Kalpakkam near

Chennai. Categorized as an invasive species in many regions of the world, it has been reported recently in Tampa bay. Florida (Power *et al*., 2004).

Features: To adjust to the high sediment content in the water the mussel has adopted an efficient way to filter out the sediments using only the finest food particles for energy requirements. This advantage is gained through the use of labial palps that extend through half of the mantle cavity and capable of producing strong ciliary currents. The ability of the mussel to dispose of the sedimentary particles is directly related to the copious amounts of mucous produced by the mussel. *P. viridis* to have a high organic retention efficiency that may be related to the internal morphology of the bivalve.

Reproduction and Growth: Sexes in this species is separate and the fertilization is external. Spawning is closely related to the monsoon seasons and occurs twice a year during March and April and October and November. It is most prevalent during southwest monsoon rainfall. However, green mussels located in Thailand and in the Philippines exhibit continuous breeding throughout the year. Sexual maturity typically occurs at 15-30 mm shell length (corresponding to 2-3 months). The life span of *P.viridis* is typically 2-3 years. Growth rates are influenced by environmental factors such as temperature, food availability and water movements. First year growth rates vary between locations and range from 49.7 mm/yr in Hong Kong to 120 mm/yr in India. In the natural beds if Kakinada Bay the green mussel grows to 63, 91.5, 107, 117,129 and 135 mm in shell length in 0.5,1.0,1.5,2.0,3.0 and 4.0 years respectively (Narasimham, 1980)

Larval Development: Spawning is initiated by either sex of the green mussel with each releasing two streams of gametes into the water. Spawning has also been induced by the presence of other spawning individuals in the area and a drop in salinity. Females release about 5 lakh eggs. Seven to eight hours after fertilization, the zygote is completely transformed into mobile, trochophore larvae. After 16 to 19 hours the veliger larval stage is reached with the larval shell covering the internal body parts and developing a strong ciliated velum. The straight hinge 'D' shaped lavae metamorphoses to pediveliger with apedal organ, the functional foot and descends to the bottom. The larvae completely metamorphosize in eight to twelve days. In 10-12 days the larvae secrete the initial byssal threads and attaches itself. Changes in organ system takes place and the post larvae with characteristics of adult mussel called spat are formed. The mussel starts looking for a suitable foundation to attach itself to. The larva examines the different surfaces it meets and when it finds a suitable surface, it attaches itself with a few byssus threads. This method of anchoring is secreted from a byssus gland and is used the whole of its life span. The more the mussel is exposed to waves and currents, the more byssus threads it developes. If the mussel should need to move, it cuts off its threads and develops new later. *Perna viridis* has the greatest growth rate of the mussels studied to date. Maximum growth of the green mussel occurs 2m below the surface because of the increased productivity of the water at that depth and a narrow area of temperature and salinity fluctuation.

Feeding: *Perna viridis* is a suspension feeder. This species is an efficient filter feeder, feeding on small zooplankton, phytoplankton and other suspended fine organic material.

Parasite: An unidentified adult digenetic trematode, of the genus *Gorgoderina*, has been found in this mussel.

Salinity tolerance: The high growth rate of the green mussel is related to high salinity and an abundance of phytoplankton. Mussel has a 50% salinity tolerance between 24 and 80 ppt. The green mussel has a high tolerance for reduced salinities, increased survival during atmospheric exposure, and high survival rates in turbid water (Vakily, 1989)

Temperature tolerance: The growth is significantly affected by temperature. Between temperatures of 10-35°C the green mussel is 50% temperature tolerant.

Reference:

1. Kuriakose and Nair 1976.The genus Perna along the coast of India with the description of a new species *Perna indica.* Aquatic biology, 1: 25-36.
2. Nair,K.V.K and P.Murugan 1991. Biofouling of *Perna viridis* in deep submarine tunnel system at Kalpakkam. *J. mar. boil. Ass. India* 33(1&2): 366-373.
3. Narasimham, K.A. 1980. Fishery and biology of the green mussel, Perna viridis (Linnaeus). Bull.Cent.Mar.FishResh Inst. 29:10-17.
4. Power ,Alan J., Randal L. Walker, Karen Payne & Dorset Hurley.2004.First Occurrence of the Non indigenous Green Mussel, *Perna viridis* (Linnaeus, 1758) in Coastal Georgia, United States. Journal of Shellfish Research, Vol. 23(3), 741-744.
5. Vakily, J.M. 1989. The biology and culture of mussels of the genus *Perna.* ICLARM Stud. Rev. 17:1-63.